21. (As Filed) The system of claim 20, wherein said index-matching medium comprises a chlorofluorocarbon polymer.

22. (As Filed) The system of claim 21, wherein said polymer includes chlorotrifluoroethylene.

23. (Amended) The system of claim 20, wherein said index-matching medium has a refractive index between 1.30 and 1.45.

REMARKS

In the Office Action dated October 16, 2002 (paper no. 11), Claim 23 was rejected under 35 U.S.C. §112, ¶2 and all of the claims were rejected under 35 U.S.C. §102 and/or §103 in view of certain references cited either alone or in combination. Claims 1 – 4, 14, 15, 19, 20, and 23 have been amended. The amendments are highlighted in an Appendix by underlining added material and enclosing deleted material in square brackets.

A. §112 Rejection

Claim 23 has been amended by removing the words "about," thereby obviating the rejecting that these words render the claim indefinite.

B. Prior-Art Rejections

The claims have been amended to limit the target tissue spectral data to *optical* data and to perform the verification by comparing *optical spectral distributions* of authorization and target spectral data. These limitations are disclosed in the specification

at, for example, p. 14, l.13 – p. 15, l. 2. and p. 22, l. 10 – p. 23, l. 17. It is believed that the cited prior art neither discloses nor suggests the combinations of limitations in the claims in light of these amendments. In addition, certain typographical errors in the claims have been corrected.

Applicants note initially that much of the prior art cited in the Office Action is directed to the use of *spatially distributed characteristics* in performing identifications in the form of spatial fingerprint distributions, spatial distributions of vascular structure, spatial distributions of facial features, spatial distributions of bone structure, and the like. This is in marked contrast to the pending claims, which compare *spectral* distributions in making identifications. Applicants have discovered how to use the comparison of such spectral distributions for identification purposes in a simple manner that is neither disclosed nor suggested in the cited art. Such spectral distributions may contain information related to the *composition* of the tissue, in addition to other information (Application, p. 20, 19 – 22). The only cited reference that compares spectral distributions is U.S. Pat. No. 5,655,530 ("Messerschmidt"), but as discussed in further detail below it provides no suggestion that such a comparison of spectral distributions may be used for identification purposes. This recognition is instead the product Applicants' insight. Indeed, Messerschmidt actually teaches looking for quantitative *similarities* among individuals for diagnostic purposes, not to looking for *distinctions* that provide the bases for making identifications.

1. Ott

Claims 1, 2, 5, 7, and 8 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pat. No. Re29,008 ("Ott"); Claim 14 stands rejected under 35 U.S.C. §103(a) as unpatentable over Ott in view of U.S. Pat. No. 6,317,507 ("Dolfing"); and Claim 19 stands rejected under 35 U.S.C. §103(a) as unpatentable over Ott in view of U.S. Pat. No. 5,559,504 ("Itsumi").

Ott teaches the use of *sonic* energy in making identifications (Ott, Col. 3, ll. 7 – 12). Since all of the claims are now limited to *optical* measurements, it is believed that the claims are patentable over Ott.

2. Prokoski

Claims 1, 2, 5 – 8, and 12 – 14 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pat. No. 5,163,094 ("Prokoski"); and Claims 15 – 17 stand rejected under 35 U.S.C. §103(a) as unpatentable over Prokoski in view of U.S. Pat. No. 4,944,021 ("Hoshino").

Prokoski teaches the use of thermograms to identify individuals from biosensor data (Prokoski, Col. 3, ll. 19 – 23). Such thermograms reflect data related to the *spatial* structural configuration of blood vessels beneath skin, as well as spatial structural configurations of bone and cartilage. It is because of this focus on spatially derived structural identifications that Prokoski teaches identifying specific elemental shapes as providing a "signature" of an individual used in confirming identity (*id.*, Col. 3, ll. 38 – 42).

Prokoski does not teach or suggest making identifications based on comparing optical spectral distributions of an individual's tissue as the claims now require. For at least this reason, it is believed that the claims are patentable over Prokoski.

3. Stoianov

Claims 1 – 4 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pat. No. 5,761,330 ("Stoianov").

Stoianov teaches the use of optical-digital hybrid techniques for automating fingerprint verification to identify an individual (Stoianov, Col. 1, ll. 6 – 9). In performing such identifications, Stoianov simply uses the well-known technique of

comparing spatial fingerprint-pattern structures with a database of recorded fingerprint patterns (*id.*, Col. 5, ll. 27 – 39). As such, it is limited to disclosing the use of a technique based on spatially distributed characteristics for performing the identification of individuals.

Stoianov does not teach or suggest making identifications based on comparing optical spectral distributions of an individual's tissue as the claims now require. For at least this reason, it is believed that the claims are patentable over Stoianov.

4. Toyoda

Claims 1, 10, 11, and 14 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Pat. No. 5,999,637 ("Toyoda").

Toyoda is also limited to disclosing identifications based on spatially distributed characteristics, and focuses particularly on the use of fingerprint identifications (Toyoda, Col. 4, ll. 63 – 66), as acknowledged in the Office Action.

Toyoda does not teach or suggest making identifications based on comparing optical spectral distributions of an individual's tissue as the claims now require. For at least this reason, it is believed that the claims are patentable over Toyoda.

5. Messerschmidt, Robinson, and Peterson

Claims 1, 12, 13, and 19 – 23 stand rejected under 35 U.S.C. §103(a) as unpatentable over the combination of U.S. Pat. No. 5,655,630 ("Messerschmidt"), U.S. Pat. No. 4,975,581 ("Robinson"), and U.S. Pat. No. 6,330,346 ("Peterson"); Claims 15 – 17 stand rejected under 35 U.S.C. §103(a) as unpatentable over this combination further in view of Hoshino; and Claim 18 stands rejected under 35 U.S.C. §103(a) as unpatentable over this combination further in view of Hoshino and Toyoda.

Messerschmidt is cited for its disclosure of obtaining spectral data from tissue and Peterson is cited for its use of spectral information in performing identifications (Office Action, p. 15). However, Applicants respectfully disagree with the assertion in the Office Action that Peterson teaches using the spectral information "in a manner very similar to that of Messerschmidt" (*id.*, p. 15).

In particular, Peterson is like the other prior art references discussed above in that its teachings are limited to the use of *spatially* distributed characteristics in performing identifications. This is evident not only from its reference to "illuminating subcutaneous structure and/or conditions" for comparison with stored indicia (Peterson, Col. 1, ll. 16 – 23), but also from the description of the device used:

> As seen in FIG. 1, a plurality of infrared light-emitting diodes are arranged, as is explained in detail hereinafter, such that they provide relatively even and continuous illumination of the object. The sensor array which is spaced by the mask and located beneath the field of view limiting holes assures that there is no cross-feed which might distort the image.
> (*Id.*, Col. 2, ll. 49 – 55).

The emphasis by Peterson on collection of an "image" and the need to avoid distortions by cross talk makes it clear that it is describing a method for illuminating subcutaneous tissue to collect spatially distributed structural information. There is nothing in Peterson that suggests the use of spectrally distributed characteristics in making identifications.

Applicants thus continue to traverse the assertion in the Office Action that there is a motivation to combine the teachings of Messerschmidt and Peterson. There is no suggestion in these references that it would be beneficial to use the spectral-distribution determinations of Messerschmidt with the spatial-distribution determinations of Peterson. Explained differently, Messerschmidt describes a *non-imaging* system that uses the measurement of multiple wavelengths of light as the input data to a spectrum analyzer (Messerschmidt, Figs. 1 and 2). In contrast, Peterson's system is an *imaging* system based on an array of source and detector elements (Peterson, Col. 2, l. 58 and Fig. 1).

Indeed, Applicants believe that at the time of their invention, it would not have been clear to one of skill in the art why or how an identification technique based on optical spectral distributions as embodied in the claims could work. For example, the specific illustration provided by Messerschmidt is concerned with using the spectrographic techniques for quantifying glucose levels in individuals (Messerschmidt, Col. 5, ll. 49 – 54). Knowing this glucose level is insufficient to distinguish large groups of individuals (and indeed seems better for grouping them rather than discriminating among them), particularly since glucose levels vary over time in response to metabolic functions. It was only the product of Applicants' insight that identified how optical spectral distributions could be used for identification purposes on an individual-by-individual basis and over time.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is urged. If the Examiner believes a telephone conference would aid in the prosecution of this case in any way, please call the undersigned at 303-571-4000.

Respectfully submitted,

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APPENDIX: VERSION WITH MARKINGS TO SHOW CHANGES MADE

The changes made to the claims by the foregoing Amendment are highlighted by underlining added material and enclosing deleted material in square brackets.

Claims 1 – 4, 14, 15, 19, 20, and 23 have been amended:

1. (Amended) A method for verifying the purported identity of a target individual utilizing a number of authorization tissue spectral data from verified individuals having known identities, said spectral data having a plurality of measurement wavelengths, comprising the steps of:

obtaining target tissue spectral data from tissue of said target individual[s], said target tissue spectral data having a number of optical measurement wavelengths; and

positively verifying said target individual purported identity by comparison of optical spectral distributions of said authorization tissue spectral data and said target tissue spectral data **[relative to a preselected threshold]**.

2. (Amended) The method for verifying the purported **[identify]** identity of a target individual as recited in claim 1, wherein the method further includes calculating a difference between the optical spectral distributions of said target tissue spectral data and said authorization tissue spectral data.

3. (Amended) The method for verifying the purported **[identify]** identity of a target individual as recited in claim 2, further evaluating the difference calculated wherein said evaluation is done by a model that identifies between patients' differences.

4. (Amended) The method for verifying the purported **[identify]** identity of a target individual as recited in claim 2, wherein said differences are processed through a model to determine the significance of identified differences.

5. (As Filed) The method for verifying the purported identity of a target individual as recited in claim 1, wherein said number of authorization tissue spectral data is greater than one.

6. (As Filed) The method for verifying the purported identity of a target individual as recited in claim 1, wherein said number of verified individuals is equal to one.

7. (As Filed) The method for verifying the purported identity of a target individual as recited in claim 1, wherein said number of verified individuals is greater than one.

8. (As Filed) The method for verifying the purported identity of a target individual as recited in claim 1, further comprising obtaining a number of authorization tissue spectra from an individual, said number of authorization tissue spectra being greater than two.

9. (As Filed) The method for verifying the purported identity of a target individual as recited in claim 1, wherein said target spectrum is added to said authorization spectra after said verification.

10. (As Filed) The method as recited in claim 1, wherein said number of measurement wavelengths is greater than four, further comprising calculating an inter-person spectral distance between said authorized spectra of said verified individuals at said wavelengths, wherein said wavelengths are selected at least in part to maximize said inter-person spectral differences.

11. (As Filed) The method as recited in claim 10, wherein said number of authorization tissue spectra is greater than four, further comprising calculating an intra-person spectral distance between said authorization spectra for an individual at said wavelengths, wherein said wavelengths are selected at least in part to minimize said intra-person spectral differences.

12. (As Filed) The method as recited in claim 1, wherein said tissue spectra include near-infrared wavelengths.

13. (As Filed) The method as recited in claim 12, wherein said tissue spectra includes a substantial spectral contribution from subcutaneous blood.

14. (Amended) A method for verifying the purported identity of a target individual comprising the steps of:

obtaining a number of authorization tissue spectra from a number of verified individuals, said authorization tissue spectra having a plurality of measurement wavelengths, said verified individuals having identities;

obtaining a target tissue spectrum from tissue of said target individual, said target tissue spectrum having a number of optical measurement wavelengths;

performing discriminant analysis on optical spectral distributions of said target tissue spectrum and said authorization tissue spectra for said purported identity; and

positively verifying said target purported identity if, and only if, said discriminant analysis is satisfied.

15. (Amended) A system for verifying the purported identity of a target individual comprising:

an authorized database including near-infrared tissue spectra for a plurality of authorized persons;

means for obtaining a near-infrared tissue spectrum and purported identity from said target individual;

means for discriminating between optical spectral distributions of said target individual near-infrared spectrum and said authorized persons near-infrared spectra, utilizing said authorized person database and said target spectrum; and

means for indicating if said target individual purported identity is correct.

16. (As Filed) The system as recited in claim 15, wherein said discriminating means utilizes said target purported identity.

17. (As Filed) The system as recited in claim 16, wherein said means for obtaining said target individual spectrum includes means for measuring near-infrared radiation reflected from subcutaneous tissue of said authorized individual.

18. (As Filed) The system as recited in claim 17, wherein said near-infrared spectra includes a plurality of measurement values, each associated with a wavelength, wherein said means for discrimination includes means for calculating a spectral difference between any of said spectra, and said means for discrimination includes means for selecting a plurality of said wavelengths, such that spectral differences between said spectra of said authorized persons is maximized.

19. (Amended) A system for verifying the purported identify of a target individual comprising:

a computer including an input device and an output device;

a database including near-infrared tissue spectra for a plurality of authorized persons;

means for obtaining a near-infrared tissue **[spectra]** spectrum from tissue of said target individual, including a near-infrared radiation source for projecting near-infrared radiation subcutaneously and a near-infrared spectrometer for measuring **[subcutaneous]** dermal near-infrared intensity over a plurality of wavelengths; and

a program running in said computer for discriminating between optical spectral distributions of said target individual near-infrared spectrum and said authorized persons near-infrared spectra utilizing said authorized person database and said target spectrum.

20. (Amended) The system of claim 19, wherein said means for obtaining a near-infrared tissue **[spectra]** spectrum includes an input element and an output element coupled to said tissue via an index-matching medium.

21. (As Filed) The system of claim 20, wherein said index-matching medium comprises a chlorofluorocarbon polymer.

22. (As Filed) The system of claim 21, wherein said polymer includes chlorotrifluoroethylene.

23. (Amended) The system of claim 20, wherein said index-matching medium has a refractive index between **[about]** 1.30 and **[about]** 1.45.